Project Type: Research & Development Project

Title: Influence of Weed Population, Establishment Method and Soil Characteristics on Conversion of Weedy Lawn Areas to Tall Fescue

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Abstract:
Use of appropriate turfgrass species and varieties, together with reasonable management practices, can reduce reliance on chemical fertilizers, water and pesticides. There is growing interest in more sustainable turfgrass species, such as tall fescue, that require less water, fertilizer and pesticides to maintain density. This project compared site characteristics, timing and pre-seed site preparation to develop a protocol for the conversion of weedy lawn areas to tall fescue. In this study, rapid infestation of weeds following seeding, together with unfavorable site conditions, prevented successful establishment of tall fescue at both sites and timings. Scalping (very low mowing) as a technique for mechanical control of existing vegetation was not effective, regardless of scalping height. Chemical control of vegetation was also unsuccessful. While establishment of tall fescue was not successful, a decrease in dandelion population in the Kentucky bluegrass site was observed in plots mowed to one inch in the fall timing. This research, while still unable to replicate previous success with establishment of fine fescue native areas, suggests properly timed scalping of existing lawn areas can significantly reduce weed populations on rhizomatous turf species such as Kentucky bluegrass.

Background and Justification:
Increasing labor costs and other budgetary considerations, together with restrictions on fertilizer and pesticide use, have created a growing need for alternative ways to deal with turf pests, especially weeds. The use of lower maintenance turfgrass species, such as fescues, can lead to reductions in fertilizer applications, pesticide use and irrigation. Previous research conducted at Cornell in 2010 showed that severe scalping, or fraise mowing, provided an effective alternative to glyphosate for establishing fine-leaf fescue from seed in the spring. The study also showed significantly less broadleaf weed invasion in these plots than plots established using glyphosate in the fall.

An evaluation of transition to tall fescue in home lawns was conducted in 2013. In that study, mechanical weed control was not effective in the spring or fall timing. Differences in level of weed control may have been influenced by several factors including weather conditions, types of weeds in the existing vegetation, severity of scalping and soil characteristics. This project included fraise mowing in an effort to reproduce the same kind of weed control observed in the 2010 study, without use of glyphosate. The goal was to identify an effective method of transition from weedy lawn areas to tall fescue and reduce fertilizer, irrigation, weed infestations, as well as provide acceptable visual appeal.

Objectives:

1. Develop protocol for converting lawn areas to tall fescue based on site conditions, timing and pre-seed site preparation.

2. Develop educational materials and presentations for industry and consumer audiences.

Procedures:

Objective 1. Trials were conducted on two sites at the Cornell University Turfgrass and Landscape Research Center in Ithaca, NY. Site 1 was a Kentucky bluegrass blend established from sod in 2010. Site receives full sun and was mowed regularly but not fertilized or irrigated. Infestations of clover and dandelion were present throughout. Soil type was sandy loam with pH 7.4 and organic matter content of 4.6%. Available phosphorus was high, at 76 lbs/acre, and no supplemental fertilizer was applied.

Existing vegetation for the spring timing was quantified on 10-Jun by visual estimates of predominant species. Population consisted of approximately 75% Kentucky bluegrass, 15% clover and 10% dandelion. A similar assessment was made for the fall timing on 18-Aug. Vegetation consisted of approximately 60% Kentucky bluegrass, 20% clover and 20% dandelion.

Site 2 was a perennial ryegrass variety trial that had been stripped of vegetation and allowed to regrow. Site receives full sun and was mowed occasionally but not fertilized or irrigated. Some perennial ryegrass was present, but vegetation was weedy, including a significant population of clover, as well as bentgrass and crabgrass. Soil type was sandy loam with pH 5.8 and organic matter content of 2.4%. Available phosphorus was very high, at 127 lbs/acre, and no supplemental fertilizer was applied.

Existing vegetation for the spring timing was quantified on 10-Jun by visual estimates of predominant species. Population consisted of approximately 80% clover, 10% bentgrass 5% crabgrass and 5% other, including oxalis, Canada thistle and perennial ryegrass. A similar assessment was made for the fall timing on 18-Aug. Vegetation consisted of approximately 60% clover, 25% crabgrass, 10% bentgrass and 5% other.

There were two timings at each site, mid-June and late August. Glyphosate (Round-Up) was used as a traditional chemical method for pre-seed control of vegetation. The alternative mechanical methods included scalping to the ground, also known as fraise mowing, and scalping to one inch. One-inch scalping was done using a Toro Personal Pace rotary lawnmower (Figure 1). Fraise mowing was done using a KBG Machines 'Combinator' unit (Figure 2). Seed was a blend of three cultivars of tall fescue (Figure 3) applied by slit seeder at 8 lbs/1000 ft^2 (Figure 4).

Figure 1. Scalping to one inch

Figure 2. Scalping to ground (fraise mowing)

Variety	Purity %
Mustang 4 Tall Fescue	33.30
Bullseye Tall Fescue	32.99
Hemi Tall Fescue	32.93

Weeds %: 00 Other Crop %: 00
No noxious weeds **Tested:** 01/14

Figure 3. Tall fescue seed blend

Figure 4. Slit seed, 8 lbs/1000ft^2

Experimental plots were 4' x 4' arranged in a strip split plot design with four replications. Split plots received application of Round-Up on 13-Jun. Control plots were untreated. On 15-Jun, strips were scalped to one inch or fraise mowed and slit seeded (Figures 5 & 6). Protocol was the same for the fall timing, starting with Round-Up applications on 25-Aug, followed by scalping and seeding on 27-Aug (Figures 7 & 8). Average rainfall was higher than normal during the study, but light irrigation was applied as needed to keep seed bed moist through germination, about 10 days.

Figure 5. Kentucky bluegrass site, mid-June seeding

Figure 6. Perennial ryegrass site, mid-June seeding

Figure 7. Kentucky bluegrass site, late August seeding

Figure 8. Perennial ryegrass site, late August seeding

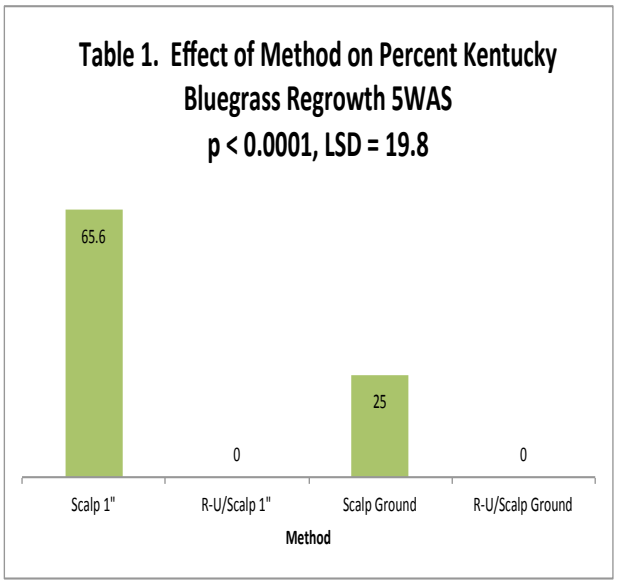
Objective 2. Results from this study, as well as those from the 2010 fraise mowing research and last year's Community IPM grant project (Evaluation of Non-Chemical Methods to Transition Lawns to Low Maintenance Turfgrass Species) were presented at the NYS Turfgrass Association Conference in November 2014. Project implementation and results are documented in a PowerPoint presentation. Trial plots will be evaluated through 2015 to assess changes.

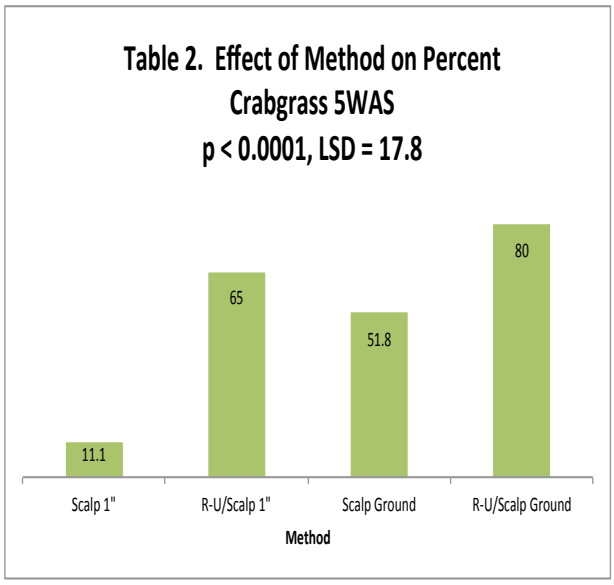
A discussion of the environmental and economic benefits of using more sustainable turfgrass species in home lawns, including recent and on-going research with fescues, is an important topic covered in Master Gardener training. Seven sessions presented in 2014 included 14 counties around the state and reached approximately 300 Master Gardener trainees and county educators.

Results/Spring Timing:

Kentucky bluegrass site. Regrowth of Kentucky bluegrass and infestation by weeds, mainly crabgrass, were observed ten days after seeding, with little germination of tall fescue. By five weeks after seeding, there was minimal establishment of tall fescue in any of the plots, regardless of treatment.

There was a significant fraise x Round-Up interaction for percent Kentucky bluegrass regrowth and crabgrass infestation five weeks after seeding. No regrowth of Kentucky bluegrass was seen in plots receiving Round-Up, regardless of scalp method. Plots receiving the one-inch scalp had 65% regrowth of Kentucky bluegrass compared to 25% for plots scalped to the ground (Table 1 and Figure 9). Populations of clover and dandelion in the one-inch scalp plots remained similar to pre-treatment populations, approximately 25%. Crabgrass infestation was significantly higher in Round-Up plots scalped to the ground compared to plots that were not treated with Round-Up (Table 2 and Figure 10).





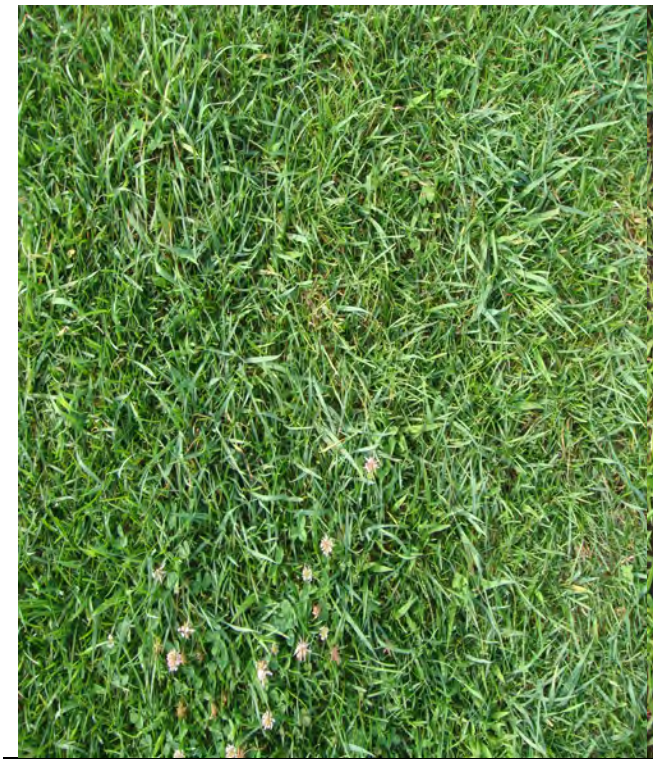
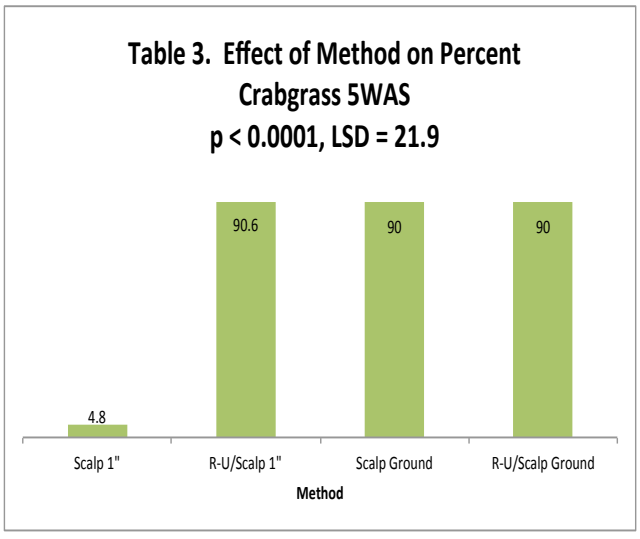


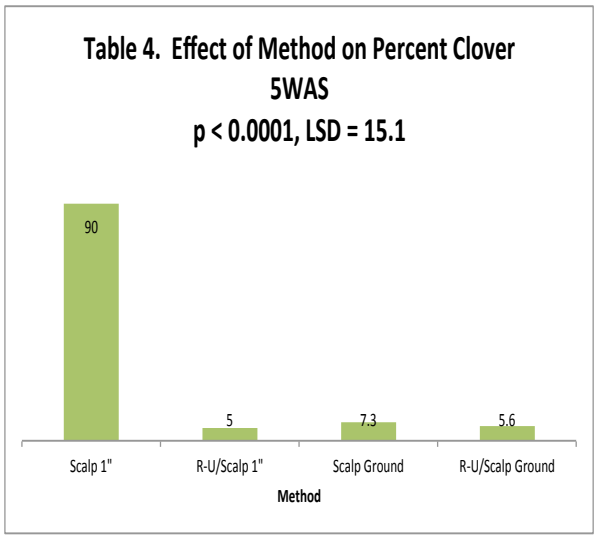
Figure 9. KBG Regrowth (scalp 1", no Round-Up, 5WAS)

Figure 10. Crabgrass (scalp ground, Round-Up, 5WAS)

Perennial ryegrass site. There was little germination and establishment of tall fescue. By five weeks after seeding, the site was nearly completely filled with crabgrass and clover.

There was a significant scalp x Round-Up interaction for percent crabgrass and clover infestation five weeks after seeding. Plots scalped to the ground and Round-Up plots scalped to one inch were 90% crabgrass (Table 3 and Figure 13). Plots mowed to one inch with no Round-Up were 90 percent clover (Table 4 and Figure 14).





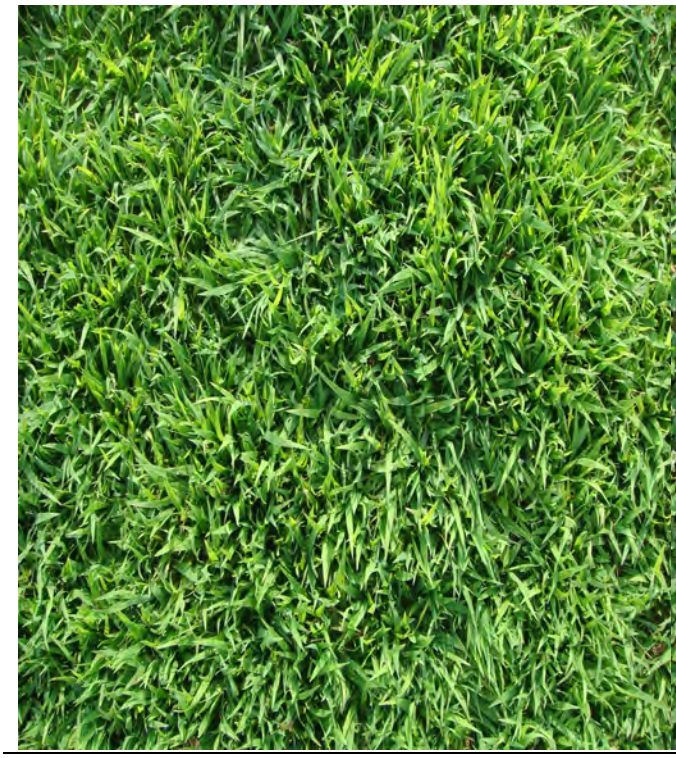


Figure 13. 90% crabgrass in plots scalped to ground, and in plots scalped to 1", Round-Up (5WAS)

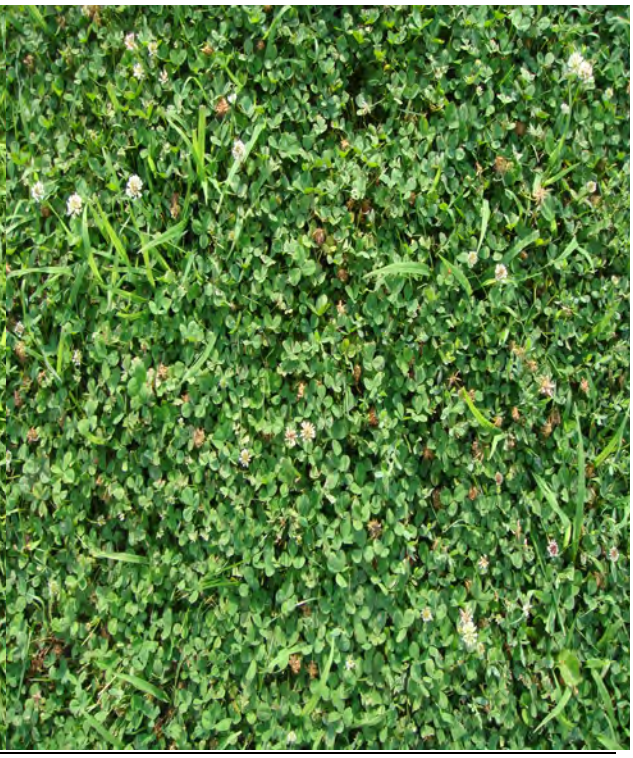


Figure 14. 80% clover in plots scalped to 1", no Round-Up (5WAS)

Results/Fall Timing:

Kentucky bluegrass site. Some germination of tall fescue was observed in plots receiving Round-Up ten days after seeding. However most vegetation was the regrowth of Kentucky bluegrass and infestation by weeds, mainly crabgrass, dandelion and clover.

At five weeks after seeding, there was about 10% establishment of tall fescue in Round-Up plots scalped to an inch, and about 20% establishment in Round-Up plots scalped to the ground. There was also significant regrowth of Kentucky bluegrass in plots that did not receive Round-Up. Weeds included small populations of crabgrass as well as clover and dandelion. Large areas in Round-Up plots were free of vegetation at 5WAS (Figure 15) and remained approximately 40% bare when evaluated again at 8WAS.

Poor establishment of tall fescue on this site was likely related to the excessive thatch layer (> 1"). Maximum slit seeder depth was apparently not sufficient to penetrate the layer and seed did not have good soil contact necessary for successful germination. Plots that were scalped to the ground had better germination that plots scalped to an inch, probably a result of removal of at least part of the thatch layer (Figures 16 and 17).

Figure 16. Germination in plots scalped to ground (5WAS)

Figure 17. Germination in plots scalped to 1” (5WAS)

Clover and dandelion populations in Kentucky bluegrass regrowth were assessed eight weeks after scalping. While clover populations remained similar to the pre-treatment populations, reduced dandelion populations were observed in non-Round-Up plots scalped to an inch (Table 5, Figures 19 and 20).

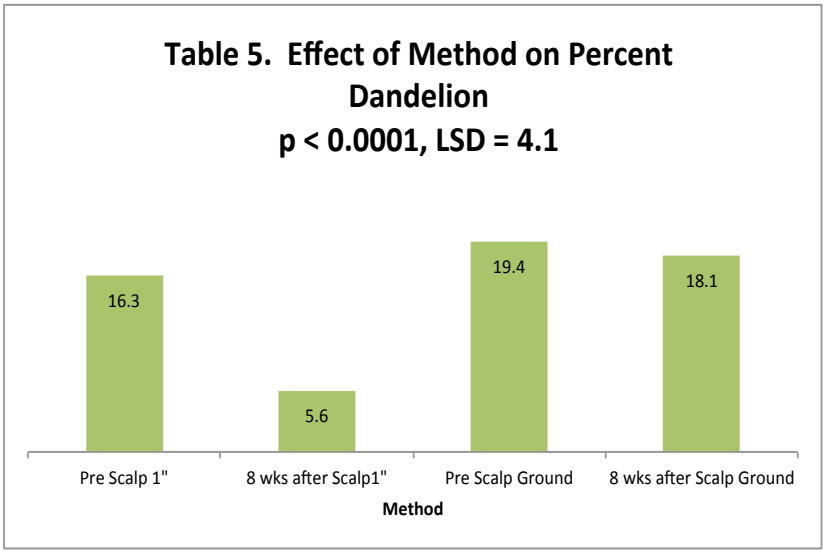
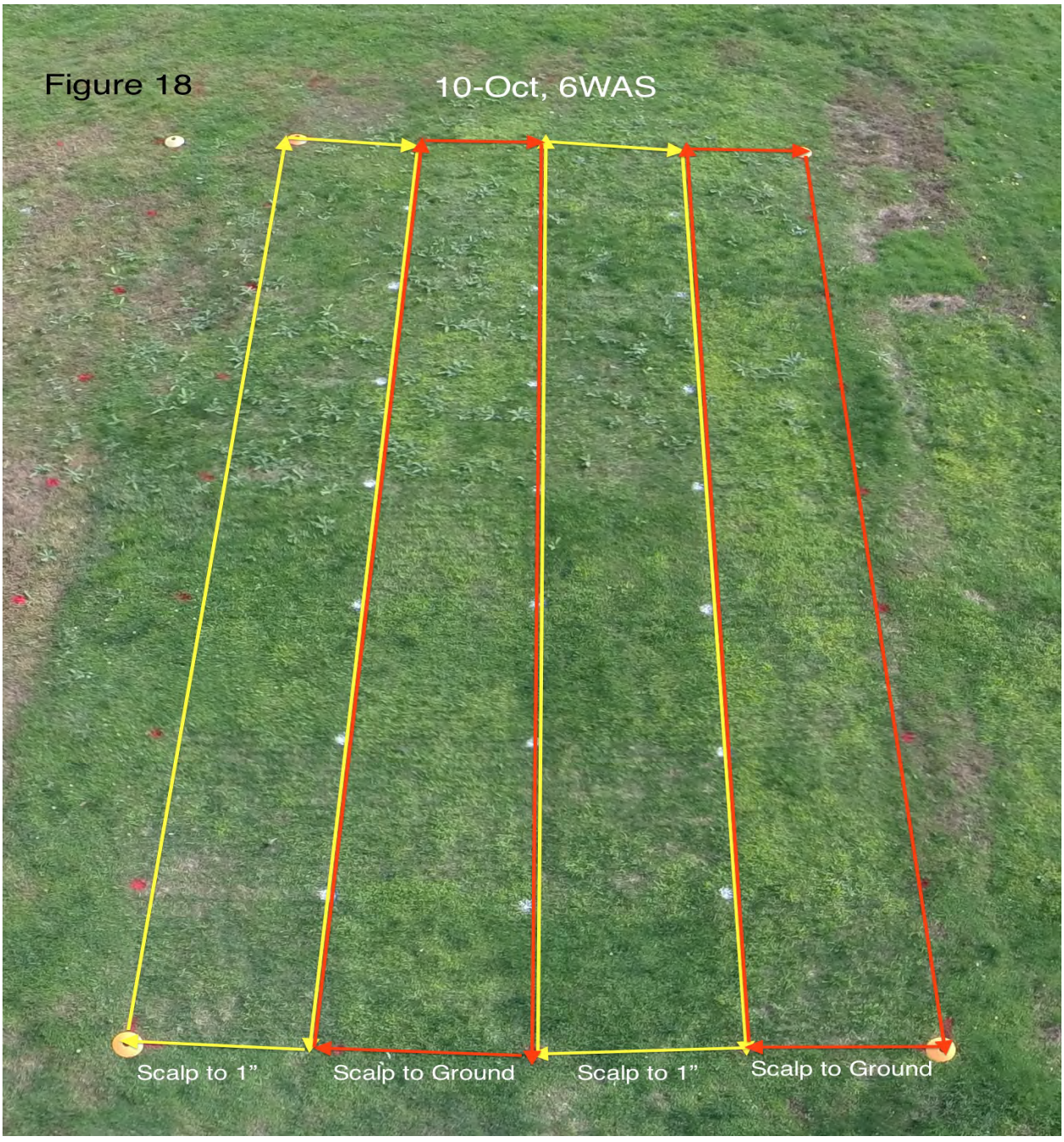


Figure 19. 23-Aug, before 1" scalp

Figure 20. 17-Oct, 8 wks after 1" scalp

Perennial ryegrass site. Germination of tall fescue was observed ten days after seeding, mostly in plots that were treated with Round-Up. Overall establishment was poor, and within a month most of the vegetation was clover and crabgrass. There was also a population of Canada thistle in the upper half of the site.

At six weeks after seeding, there was about 25% establishment of tall fescue in Round-Up plots scalped to an inch, and about 5% establishment in Round-Up plots scalped to the ground. Clover dominated in plots scalped to an inch while crabgrass was the main weed in plots scalped to the ground (Figure 18).



Discussion:

Establishment efforts in 2014 were not successful in transitioning weedy lawn areas to more sustainable turf species. Additionally, except for an example of dandelion reduction, scalping was not an effective method of weed control in this study. In fact, plots receiving the more severe method of scalping had greater infestations of crabgrass. This was especially evident on the perennial ryegrass site. Use of the fraise mowing technique here apparently disturbed the soil enough to expose crabgrass seed to sunlight and encouraged rapid growth of crabgrass in both spring and fall timings.

Poor germination and establishment was likely due at least in part to site conditions. Excessive thatch on the Kentucky bluegrass site prevented seed from reaching the soil. An aggressive core aerification program or complete removal of the sod and thatch layer prior to seeding would be necessary to ensure good seed to soil contact.

The perennial ryegrass site was not affected by thatch, but soil test results suggest that low fertility may have been a factor in poor establishment. Soil on this site had an organic matter content of 2.4%, well below the 4-8% generally considered adequate for establishment of turfgrass. Release of nitrogen from organic matter stored in the soil can be a significant source of this essential nutrient, particularly when supplemental fertilizer is not applied.

While we did not identify a successful strategy for converting existing lawn areas to tall fescue, the decrease in dandelion populations observed following the one-inch scalp in the Kentucky bluegrass fall timing is interesting. Further research to investigate whether well-timed scalping of established lawn areas can reduce weed populations may provide non-chemical alternatives.